

**Engagement Opportunities in NASA STEM 2023 (EONS-2023)**  
**NASA Research Announcement (NRA)**  
**MUREP Space Technology Artemis Research (M-STAR)**  
**Number: NNH23ZHA001N-MSTAR**

**Title:** CubeSat Technology Exploration Program (CubeSTEP)

**Institution:** Cal Poly Pomona Foundation

**City/State:** Pomona, CA

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**FY:** 2023

Summary: The CubeSat Technology Exploration Program (CubeSTEP) is a collaborative effort between Cal Poly Pomona (CPP) and NASA's Jet Propulsion Laboratory (JPL) aimed at developing technology for small-scale space missions. The program's central objective is to build a 3U CubeSat bus that can accommodate payloads from NASA and other industry partners. Through this initiative, CPP aims to position itself as one of the leading universities with the heritage and capability to partner on technology demonstration missions under the NASA STMD portfolio.

To achieve this goal, CubeSTEP will work with JPL to integrate a thermal technology based on Oscillating Heat Pipes (OHPs) that can accommodate high-power payloads, such as those planned for the Artemis program and future crewed missions. This OHP will be the first payload for CubeSTEP. Additive manufacturing (AM) will form the basis of this technology, which will be used in the design and fabrication of the CubeSat bus. This approach enhances CPP's understanding of CubeSat design and manufacturing using additive manufacturing techniques, positioning the university to rapidly design, fabricate, and integrate future payloads.

The CubeSTEP program will span three years, during which the team will design, fabricate, and test JPL's OHP in the 1U CubeSat form factor embedded in a battery case that will be pushed to thermal runaway. The technology demonstration will prove the performance of OHP in spaceflight. Additionally, a 2U common bus will be designed to support the payload, and the entire structure and battery case embedding the OHPs will be additively manufactured with AlSi10Mg. The bus design will be reusable for future payloads, allowing for a focus on technology demonstration aspects. CPP students will play an essential role in the research, design, fabrication, testing, and integration of the entire CubeSat and its payload with the guidance of mentors at CPP and JPL.

CubeSTEP's ultimate aim is to create a technology investment and invest in a program that educates students and connects with the community to engage more students in NASA's technology development. CPP has a diverse student population of around 27,000, with nearly 60% being the first in their family to attend college, 75% receiving financial aid, and 43% qualifying as Pell eligible. About 41% of the student body majors in STEM fields, and CPP is

the number 1 polytechnic university in the country for diversity and social mobility. With excellent programs to reach out and engage students in undergraduate research, CubeSTEP contributes to training a diverse workforce for NASA by allowing them to engage in technology development under NASA's mentorship.